EXHIBIT B

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

VERIZON VIRGINIA, LLC and VERIZON SOUTH, INC.	)	
Complainants,	)	Docket No. 15-190
v.	)	File No. EB-15-MD-006
VIRGINIA ELECTRIC AND POWER COMPANY d/b/a DOMINION VIRGINIA POWER	)	
Respondent.	)	

DECLARATION OF WILLIAM P. ZARAKAS

I, WILLIAM P. ZARAKAS, declare as follows:

1. My name is William P. Zarakas. I am a Principal with The Brattle Group, an economics consulting firm, where I work primarily on economic and regulatory matters concerning the communications and energy industries. I have been involved in the economic analysis of issues facing these industries for roughly 30 years. I have provided reports and/or testimony before the Federal Communications Commission (FCC), the Federal Energy Regulatory Commission (FERC), the Securities and Exchange Commission (SEC), the Copyright Royalty Judges (Library of Congress), the U.S. Congress, state regulatory agencies, arbitration panels, foreign governments and courts of law. Directly relevant to this case, I am familiar with the FCC's rules and orders governing pole attachments, including the *2011 Pole*

Attachment Order,[1] and I previously provided testimony to the FCC on pole attachment matters. My CV is attached as Appendix A.

2. I am submitting this Declaration on behalf of Virginia Electric and Power Company d/b/a Dominion Virginia Power ("Dominion"), in support of Dominion's response to the pole attachment complaint of Verizon Virginia, LLC and Verizon South, Inc. (together, "Verizon") in the above-captioned proceeding. In this Declaration, I will discuss the economic value that Verizon has received and continues to receive through its joint use arrangement with Dominion, and how that value compares to the economic value that Verizon's competitors receive through pole licensing arrangements. Against that backdrop, I will opine on whether it is appropriate for Dominion to charge Verizon a pole attachment rate based on the FCC's "Telecom Rate" formula while both companies continue to own and jointly use each other's pole infrastructure.[2] I also will explain the derivation of the "average number of attaching entities" value that Dominion currently uses in calculating its Telecom Rate, and opine as to whether this value is appropriate to include in the company's pole current attachment rate calculations.

I. INTRODUCTION

3. Third party attachers, mainly competitive local exchange carriers ("CLECs") and cable television companies, are relatively new providers of communications services when compared to longer standing incumbent local exchange carriers ("ILECs"), such as Verizon. Accordingly, these entities are guaranteed mandatory nondiscriminatory access to poles, ducts,

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1 *In the Matter of Implementation of Section 224 of the Act* (WC Docket No. 07-245); *A National Broadband Plan for Our Future* (GN 09-51), Report and Order and Order on Reconsideration, 26 FCC Rcd 5240 (2011), *aff'd*, American Elec. Power Service Co. v. FCC, 708 F. 3d 183 (D.C. Cir. 2013) ("*2011 Pole Attachment Order*").

2 For purposes of this Declaration, the "Telecom Rate" refers to the rate, per attachment, that Dominion charges competitive local exchange carriers ("CLECs") that attach to its poles pursuant to Section 224(e) of the Act, 47 U.S.C. § 224(e).

conduits and rights-of-way owned by electric utilities and telephone companies through the Pole Attachment Act of 1978 and the Telecommunications Act of 1996. ILECs, in general, did not require such guarantees because they had partnered with electric utilities to build the existing pole network in which they continue to have an ownership stake. The arrangements under which ILECs and electric utilities operate, maintain and recover the costs associated with their pole networks are governed by joint use agreements which provide for voluntary grants of access.

4. I understand that Verizon and Dominion have had agreements for the collocation of facilities and joint use of one another's distribution poles in place for over 70 years.[3] The combined Dominion-Verizon pole network is comprised of [redacted], with Dominion owning [redacted] and Verizon owning [redacted], when Dominion and Verizon entered into their current Joint Use Agreements.[4] Net payments are due annually to Dominion, as the majority pole owner, based on [redacted].

5. Unlike Verizon, CLECs and cable companies attach to Dominion's poles through license agreements. As discussed in the Graf Declaration, these license agreements differ significantly from the Joint Use Agreements between Dominion and Verizon. Also, payments from CLECs and cable companies to Dominion are based on attachment rate formulas that are prescribed by the FCC, whereas the FCC has adopted no such formula for the rates paid by ILEC

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[3] *See* Declaration of Michael A. Graf ¶ 4, appended to Response as Exhibit A ("Graf Declaration"). Dominion currently has two Joint Use Agreements with Verizon, each of which is dated January 1, 2011 (the "Joint Use Agreements"). Data concerning Verizon Virginia, previously Chesapeake and Potomac Telephone (C&P) of Virginia then changed to Bell Atlantic-Virginia, are reported under study area Verizon Virginia (CVVA). Data for Verizon South are reported under study areas Contel Virginia (COVA) and GTE Virginia (GTVA). Contel was acquired by GTE in 1991. The merger of GTE and Bell Atlantic in 2000 resulted in the creation of Verizon.

[4] Joint Use Agreements, Exhibit A (appended to Complaint as Exhibits 1-2). The pole network figures used for 2011, as set forth in the Joint Use Agreements, were based on the parties' 2009 pole network data.

joint users. The rates that CLECs pay per pole attachment are less than the rates that Verizon pays Dominion under the Joint Use Agreements, which is the theme of Verizon's complaint before the Commission.

6. In its Complaint, Verizon requests that the FCC direct Dominion to charge Verizon the FCC's Telecom Rate, instead of the rates specified in the Joint Use Agreements. Verizon also proposes to charge Dominion for pole attachments based on a different formula than for Verizon's pole attachments, which results in Dominion being charged a considerably higher rate than is the case today and also higher than the rate that Verizon seeks to be charged by Dominion.[5] That is, Verizon proposes to continue to participate in a single, integrated pole network, but seeks to use separate methods under which each party would recover the costs that it incurred in building, maintaining and operating the network.

7. Verizon justifies the appropriateness of being charged the Telecom Rate by arguing that it does not receive value under the Joint Use Agreements above the levels received by its competitors.[6] Verizon structures its arguments within the context of competitive neutrality, claiming that it must be on a level playing field with its competitors for purposes of the pole rental rate that it pays Dominion because the Joint Use Agreements provide Verizon with no added value.

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5 Letter from Steve Mills, Verizon Network Engineering to Arlie Hahn, Jr. (Dec. 6, 2013) (appended to Complaint as Exhibit 14). [redacted]

6 Complaint ¶¶ 9-10.

8. However, Verizon and Dominion are each owners of poles that together comprise a network that covers their overlapping service territories.[7] In practice, the pole network is operated seamlessly, with each company using the others' poles as needed. The Joint Use Agreements reflect this fact in specifying how payments should be made between the two parties.[8] [redacted]. In essence, under the Joint Use Agreements, the costs associated with operating the joint pole network are pooled and then trued up between the two owners each year.

9. Verizon's request to be charged for pole attachments as if it were a CLEC accomplishes its goal of reducing its cost of operations, but it is fundamentally at odds with the joint ownership and operation of the Dominion-Verizon pole network and the benefits that Verizon receives through this joint ownership situation.

10. In Section II, below, I summarize the main areas of benefits that Verizon realizes through the Joint Use Agreements, both historically over the course of its joint use arrangements with Dominion, as well as the benefits that it receives on an ongoing basis. I then address the cost basis of the joint pole network, and how these costs translate into pole attachment rates and payments under the Joint Use Agreements in Section III. Finally, in Section IV, I address an issue raised by Verizon that relates to Dominion's calculation of joint use attachment rates under the FCC's Telecom Rate formula. Specifically, I provide background on Dominion's use of [redacted]

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[7] It is well understood that sharing a pole infrastructure is economically efficient and has been deemed to be an aesthetic necessity by local authorities.

[8] The Joint Use Agreements also specify other conduct with respect to the seamlessness of the joint pole network. For example, as explained in the Graf Declaration, [redacted].

attachers in its calculation of the Telecom Rate and, using recent FCC data, opine on whether this value remains relevant today.

II. BENEFITS TO VERIZON UNDER THE JOINT USE AGREEMENTS.

11. In its Complaint, Verizon asserts that it receives virtually no value under the Joint Use Agreements that could not be realized under the license agreements used by CLECs. However, as a partial owner of the joint pole network, Verizon benefits from expedited processing in completing pole attachments and also benefits from the repair and maintenance services that Dominion provides across the entire network, irrespective of pole ownership. I summarize these areas of benefit below.

12. First, from a historic perspective, it is indisputable that Verizon and its customers have benefited from the cost and deployment efficiencies associated with its joint pole use arrangement with Dominion. The Joint Use Agreements (and predecessor agreements) formed a sharing arrangement through which each party was able to reduce its costs of service without compromising quality. Furthermore, the joint use arrangement provided Verizon with the design and construction of a jointly owned pole network in precisely the service areas that Verizon requested, and then gave Verizon ready and unfettered access to the joint pole network as if it were its own. Such access was and continues to be essential for Verizon to meet its carrier of last resort (COLR) obligations, which requires Verizon, as an ILEC, to install basic services to all customers residing within its service area in a timely manner.[9] Seamless access to a pole

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[9] I understand that Virginia House Bill No. 2367 (passed in 2011) has reduced the scope of Verizon's COLR obligations. The Code of Virginia § 56-234.1 now states that "A telephone company shall not have the duty to extend or expand its facilities to furnish service and facilities when the person, firm or corporation has service available from one or more alternative providers of wireline or terrestrial wireless communications services at prevailing market rates." Thus, Verizon is relieved of COLR obligations when cost-effective alternatives are available, but will continue to be obligated to provide basic services when it is the only viable option available to a customer.

network in the era before implementation of the Telecommunications Act of 1996 also allowed Verizon to establish itself as a reliable service provider in the eyes of its customers, which was a key factor in enabling the company to establish and maintain a dominant market share in the evolving market as the "incumbent."

13. Second, Verizon continues to receive the benefits associated with streamlined operation, maintenance, and access regarding the joint pole network today, when it is directly competing with CLECs. As discussed more fully in the Graf Declaration, the terms and conditions in the Joint Use Agreements are significantly different than those included in license agreements between Dominion and CLECs. [redacted] On the other hand, Verizon requested [redacted] new attachments on Dominion's poles and paid nothing to Dominion for the permit work associated with these new attachments.[10] Verizon is able to avoid

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10 Graf Declaration, Exhibit MAG-1.

the time and cost associated with this step and, perhaps more importantly, is able to treat the Verizon and Dominion poles seamlessly, as a single network, in its planning and operations.

14. Third, Verizon directly benefits from the repair and maintenance work performed by Dominion on Verizon's poles. Verizon has represented that it is burdened by pole ownership and must maintain its poles in order to access Dominion's.[11] Whether or not Verizon prefers to own poles, Verizon nevertheless owns, and is responsible for maintaining [redacted] poles in Virginia, of which [redacted] are part of the overlapping Dominion-Verizon pole network. As I discuss further in Section III below, Dominion's per pole expenditures (both in terms of capital and maintenance) significantly exceed Verizon's spending in this area. This cost difference is in part explained by Dominion's routine performance of repairs and maintenance on the joint pole network, irrespective of whether the poles are owned by Dominion or Verizon. Verizon is thus able to manage its pole network with a smaller work force than would otherwise be the case.[12] Moreover, Dominion provides some services, such as tree trimming around and between the poles that make up the joint network, without any direct charge to Verizon. The cost that Dominion incurs to perform such work is instead reflected in the pole rental rates that are charged to Verizon under the Joint Use Agreements.

15. As an owner of poles, Verizon is inherently different from a CLEC. Verizon's preference may be to not own poles and to be treated like a CLEC but, in fact, it has an ownership stake in a pole network which is accompanied by investment and maintenance responsibilities. In addition, this ownership involved capital investment decisions by both parties

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[11] *See* Complaint ¶¶ 88-90.

[12] As an electric utility, [redacted]. Graf Declaration, Exhibit MAG-1.

over the course of seven decades in reliance on their partnership. The pole attachment rates calculated under the current Joint Use Agreements are cost based and transparent and, with net payments determined based on costs incurred and number of poles owned. Verizon's request to the Commission is thus incongruous with the underlying nature of a jointly constructed and shared pole network, and circumvents a key difference between itself and CLECs.

16. As discussed more fully in the Graf Declaration, Verizon also minimized both the operational, and the financial value of the competitive advantages that the Joint Use Agreements provide, to a level that is unrealistically low. Verizon discounts that it has an ownership stake and maintenance responsibilities in the joint pole network and, somehow, converted the benefit it receives from Dominion repairing and maintaining poles for Verizon's use to a disadvantage. It is inconceivable, in my view, that the benefits outlined in Dominion's response, and in the Graf Declaration could be valued at no more than [redacted], as Verizon contends.[13]

III. THE JOINT USE AGREEMENTS BETWEEN DOMINION AND VERIZON.

A. Differences in Rates Reflect Differences in Actual Costs Incurred.

17. For purposes of establishing the baseline (2011) annual pole rental rate under the Joint Use Agreements, [redacted]. The total payment

[13] Affidavit of Mark S. Calnon, Ph.D. (appended to Complaint as Exhibit A) ("Calnon Affidavit") ¶¶ 69, 96.

due to Dominion is equal to the pole rental rate that Dominion charges Verizon, multiplied by the number of Dominion poles to which Verizon attaches, and the total payment due to Verizon is calculated in the same manner. Payments are made each year on a net basis.

18. The difference in Dominion's and Verizon's pole rental rates is driven primarily by the capital, operating and maintenance costs associated with each company's pole assets. Dominion has invested more in its pole assets and also routinely spends more on maintenance, including incurring costs for maintaining Verizon's poles that are located in the joint network. Dominion's higher cost per pole, combined with Dominion's higher level of pole ownership, results in Verizon paying Dominion on a net basis for pole access.

19. The [redacted] was the foundation for determining the baseline annual pole rental rates due under the Joint Use Agreements. [redacted].[14] [redacted];[15] [redacted]

[14] *See* Joint Use Agreements, Exhibits B-C.

[15] *In the Matter of Commission's Rules and Policies Governing Pole Attachments* (CS Docket No. 97-98), *In the Matter of Implementation of Section 703(e) of the Telecommunications Act of 1996* (CS Docket No. 97-151), Consolidated Partial Order on Reconsideration, 16 FCC Rcd 12103, FCC 01-170 (2001), *aff'd, Southern Co. Services v. FCC*, 313 F.3d 574 (D.C. Cir. 2002) ("Consolidated Order") ¶¶ 32, 42. The bare pole adjustment factor (*i.e.*, the percentage by which net investment is further reduced) is higher for electric utilities (15%) than for ILECs (5%).

[redacted]. The annual pole rental rates are then calculated [redacted]. The baseline annual pole rental rates calculated for 2011, as set forth in the Joint Use Agreements, were based on the parties' 2009 cost data. To reflect current periods, those rates are adjusted on an annual basis by [redacted].[16]

20. Both Verizon and Dominion are large infrastructure companies and, as such, operate with similar cost structures. Thus, it is reasonable to expect that both companies would have similar net costs of bare poles, and that any differences in the resulting annual pole costs may then be attributable to differences in the factors that make up the carrying charge rates. However, this has not been the case. As shown in **Table 1**, the gross investment per pole and net cost of a bare pole have been consistently lower for Verizon than for Dominion, even after an adjustment is made for the FCC's bare pole factor. The difference in investment in pole infrastructure between the two companies is particularly pronounced with respect to the net cost per pole measure. The net cost of a bare pole for Dominion in 2009, the year used in setting pole rental rates under the current Joint Use Agreements, was [redacted]—while the comparable cost for Verizon was [redacted].[17]

21. **Figure 1** depicts that the gap in net costs of a bare pole between Dominion and Verizon has increased over time. This difference is mainly because the additions Verizon makes to its pole infrastructure each year are less than the annual increases in accumulated depreciation and deferred income taxes, so much so that Verizon's net cost of a bare pole has a negative value

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16 [redacted]

17 The net cost of a bare pole for Verizon South in 2009 was [redacted] and for Verizon Virginia was [redacted].

starting in 2010.[18] In 2009, the year used in determining the baseline annual pole rental rates under the Joint Use Agreements, [redacted].

22. [redacted]. Both Verizon and Dominion used the same rate of return in their determinations of carrying charges, and used company-specific calculations for cost factors concerning depreciation, administration, pole maintenance, and tax expenses. Cost factors, other than rate of return, are calculated by dividing the expense incurred in the cost area by the relevant investment area (*i.e.*, pole investment or investment in distribution plant).[19]

23. **Table 3** summarizes the cost factors for Verizon and Dominion, for 2002 through 2014, with the factors for 2009 used in the calculations of annual pole costs used to calculate the baseline pole rental rates under the Joint Use Agreements. [redacted]

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18 The FCC recognized the possibility of net pole costs having negative values and adopted measures to address it in the Consolidated Order, ¶¶ 30-42. Verizon's net pole cost was positive in 2009, the data year used to determine the 2011 annual pole rental rates under the Joint Use Agreements.

19 [redacted].

[redacted].

24. Verizon's high carrying charge factors, as compared to those for Dominion, are primarily due to the low level of net pole investment reflected in the denominator of the cost factor calculation. That is, Verizon is not spending more per pole than Dominion to maintain its portion of the joint pole infrastructure. On the contrary, **Figure 2** demonstrates that Dominion routinely spends considerably more per pole on pole maintenance than does Verizon. In fact, over the course of their joint use relationship, Dominion has assumed an increasing share of all work associated with maintaining the corridors in the joint pole network, including all tree trimming around and between Dominion and Verizon poles, irrespective of ownership status.

25. As referenced above, the conversion of the annual pole cost into a pole rental rate under the Joint Use Agreements [redacted]. Thus, the pole rental rate for Verizon would be lower than for Dominion assuming the same level of annual pole cost. In practice, however, the pole rental rate that Verizon charges Dominion is less than the rate that Dominion charges Verizon simply because Verizon has invested less in its infrastructure on a per pole basis.

26. The methodology for using this cost data to calculate pole attachment rates is transparent, symmetric and [redacted]. Such a framework is well suited for use in a negotiation among joint

users concerning pole rental rates because it allows the parties to specify areas of disagreement. Dominion has conveyed to me that Verizon represents that it uses less space on poles than was the case in the past. Pole rental rates can be easily modified by adjusting Verizon's space allocation factor to a lesser value commensurate with the space now used by the company, and in fact, I understand that the pole space allocated to Verizon has decreased over the course of the parties' joint use relationship, by mutual agreement of the parties.

27. Other values used in the Joint Use rate formula can also be adjusted, although to my knowledge Verizon does not dispute the accuracy of the costs of the combined Dominion-Verizon pole network in Virginia. Verizon has raised an issue with the rate of return factor that is included in the overall carrying charge factor, however both Verizon and Dominion used the exact same value for rate of return in calculating their joint use pole attachment rates.[20]

B. Net Payments Reflect Ownership Shares

28. Verizon has asserted that the current pole rental rate that it pays Dominion was forced upon it because, as a minority owner in the joint pole network, Verizon does not hold any bargaining power.[21] However, as described above, the transparent and symmetric formulas for determining rates and net payments are based on the actual costs of building, maintaining and operating a joint pole network. Under the Joint Use Agreements, Verizon and Dominion each use the exact same formula in determining the rates charged per pole. Rates per pole are then multiplied by the number of poles held by each company, and payments from Verizon to Dominion are the difference between the payment streams.[22] The transparency and mutually

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[20] [redacted]. *See*, *Consolidated Order*, Appendix E-1 and E-2.

[21] Complaint ¶¶ 15-20.

[22] *See* Joint Use Agreements, Exhibit A.

equal treatment belie any claim that Verizon has been subjected to unequal bargaining power with resulting terms that are one-sided and thrust upon Verizon.

29. Furthermore, as discussed in the Graf Declaration, the parties' shares of pole ownership have been relatively stable over the last several decades.[23] This relative stability differs from the more general industry trend observed by the FCC in its *2011 Pole Attachment Order*. There, the FCC found that pole ownership for ILECs had diminished over time from near equal shares historically, to one where they owned only about 30% or so of poles within a joint use network.[24] This industry trend was of particular interest to the FCC because it was concerned that ILECs may suffer from a deteriorated bargaining position in current rounds of joint use negotiations compared to the positions they enjoyed in the past when pole ownership shares were more even. However, as demonstrated above, this is not the case with respect to Verizon in Virginia, where the pole ownership positions that underlie bargaining power have remained the same for the last few decades.

IV. AVERAGE NUMBER OF ATTACHING ENTITIES

30. Under the FCC's Telecom Rate formula, "the costs of unusable space are separated from the costs of usable space and are allocated based on the number of attaching entities."[25] The FCC gave utilities the option of using data, or conducting surveys to establish the actual number of attaching entities per pole within their service area, or using presumptive averages developed by the FCC. The presumptive averages were set at three attaching entities

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23 Graf Declaration a¶ 4.

24 *2011 Pole Attachment Order* ¶ 216.

25 *Consolidated Order* ¶ 55.

for non-urbanized areas, and five attaching entities for urbanized areas.[26] As noted by the FCC, either party may use either a statistically valid survey or actual data to rebut the FCC's presumptions.[27] Dominion conducted a survey of its poles in the 2001-2002 time frame, and currently uses the result of that survey – [redacted] – for the Telecom Rate that it charges to all CLECs in Virginia.

31. I understand that Verizon has asserted that the FCC's presumptive average of five attaching entities per pole should be used in Dominion's Telecom Rate calculation, instead of the 2.6 value described above.[28] Counsel for Dominion requested that I summarize the design and results of Dominion's survey because I worked with the company in its 2001-2002 survey effort and provided testimony on such to the FCC. I have attached a copy of the declaration that I filed in that matter as Appendix B (Zarakas 2002 Declaration).[29]

32. I, along with my colleagues that specialized in survey sample and design, assisted Dominion in designing a survey of poles that would be statistically valid (at a level of confidence of 90% and an acceptable error of +/- 10%) at a geographically disaggregate basis, specifically for each of 83-service areas defined by Dominion.[30] The survey sample size was determined to

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26 The FCC defines an urbanized area as a "central city plus the closely-settled urban fringe" with a population exceeding 50,000. Consolidated Order ¶¶ 62, 71-72.

27 *Consolidated Order* ¶ 70.

28 Calnon Affidavit ¶ 23. For purposes of the Joint Use Agreements, [redacted]

29 *In the Matter of Virginia Cable Telecommunications Association, Complainant, v. Virginia Electric and Power Company, d/b/a Dominion Virginia Power and Virginia North Carolina Power*, File No. EB 02-MD-034, Declaration of William P. Zarakas ("Zarakas 2002 Declaration") (appended hereto as Appendix B).

30 The total of the [redacted] service areas cover the entirety of Dominion's service territory, which includes parts of Virginia and, to a lesser extent, parts of North Carolina. All of the company's service area was included in the 2001-2002 pole survey because the data used in the calculation of attachment rates were based on Dominion's total pole cost and the number of poles.

be [redacted] poles which were subsequently reduced to [redacted] after observations with missing or incomplete information were dropped.

33. Dominion field personnel collected the survey data during the fall of 2001, and were responsible for completing and signing a survey form and taking a picture of the pole observed. The completed survey forms were forwarded to Dominion Joint Use personnel who reviewed the forms for completeness and performed data entry.

34. In conducting the survey, the number of separate entities that have attachments to the pole, including power attachments, constituted the "number of attaching entities." That is, a single company with multiple attachments was counted as one attaching entity. We used the pole survey data to compute the average number of attaching entities for each of [redacted] as well as a system-wide average. In addition, we computed an alternative estimate using a more stringent definition that counted only poles with at least one non-ILEC telecommunications carrier or cable attachment in addition to attachments by the power company or an ILEC.[31]

35. The results of the survey-based analysis are summarized in Exhibits IV and V of the Zarakas 2002 Declaration. [redacted].[32] [redacted]

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[31] We referred to this alternate measure as the "Non-ILEC/Cable" scenario (granted, a somewhat confusing shorthand) because only poles that had an attachment owned by an ILEC competitor, frequently a cable company, were included in this count. This does not mean that poles to which ILECs were attached were excluded from this measure.

[32] We also categorized the 83 service areas as either urban or rural, based on the guidance provided by the FCC in its Consolidated Order, ¶ 65 (which defines urban areas to be those with populations of 50,000 or more) and ¶ 66 (in which the FCC requires utilities to conduct their analysis at the service area level). [redacted]

[redacted]. Rather than using this estimate of attaching entities in calculating pole attachment rates, however, Dominion used the average estimated for those poles that included at least one CLEC or cable attachment. By definition, this average would be higher than the system-wide averages in which all surveyed poles were included. The average calculated under this definition was [redacted], which is the number of attaching entities that Dominion currently uses to calculate the Telecom Rate.

36. Designing, conducting and analyzing the results of the 2001-2002 pole survey involved considerable time and effort on the part of Dominion. To my knowledge, the company has not conducted an additional pole survey since that time. While it is not possible to precisely determine the current accuracy of the 2001-2002 study without actually conducting a new survey, it is possible to use other data sources to corroborate the survey results, specifically, the FCC's Form 477 data.[33]

37. The FCC has collected data concerning the availability of communications services throughout most of its history, and established requirements for providers to file data concerning broadband services, local telephone competition, and mobile telephony services under Form 477 in 2000. The scope of data collected has subsequently been expanded to include the collection of data on broadband deployment previously conducted by the National Telecommunications and Information Administration (NTIA).[34] Included in the Form 477 data

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[33] I used the Form 477 data as of June 2014.

[34] *In the Matter of Modernizing the FCC Form 477 Data Program*, WC Docket No. 11-10, Report and Order, FCC 13-87 (2013). NTIA had previously been responsible for collecting data on broadband deployment in

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are the names of broadband service providers (mainly, ILECs, CLECs and cable companies) that use wireline technologies for each census block in the United States.[35]

38. Dominion provides electric services and has a pole infrastructure in place in [redacted].[36] I used the Form 477 data at the census block level of aggregation to estimate the potential number of entities that attach to Dominion's poles. Most, if not all, non-power company attaching entities provide broadband services in addition to other non-broadband services, such as cable television and voice services. Thus, the ILECs, CLECs and cable companies listed for each census block in which Dominion has poles provides a reasonable universe of potential non-power company attaching entities. I then added an additional attacher to each census block to account for Dominion itself as an attaching entity. I used these data to calculate the average number of potential attaching entities for each of the counties in which Dominion operates, and then calculated the average number of potential attachers for the utility overall.

39. **Table 4** summarizes the number of census blocks in each of the counties in which Dominion operates and the associated number of potential attaching entities (including Dominion itself) across these census blocks. I aggregated the census blocks into county designations for ease of analysis. The [redacted] census blocks in Virginia to which Dominion

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Continued from previous page

coordination with the States through its State Broadband Initiative (SBI). These data were used to develop and update the NTIA's national broadband map, among other uses.

[35] Wireline broadband service providers use technologies based on fiber optics, cable modem (via fiber, coaxial cable or hybrids), copper and/or DSL (symmetric or asymmetric). Form 477 data also includes similar data concerning broadband services providers who use wireless technologies. As of 2010, there were 11,078,297 Census Blocks in the United States. See "Census Block Tallies by State or State Equivalent," United States Census Bureau, accessed October 20, 2015, https://www.census.gov/geo/maps-data/data/tallies/census_block_tally.html.

[36] This estimate is based on a list of zip codes served by Dominion as of October 2015, provided by the company.

provides electric service make up or are part of 80 counties.[37] For example, review of the FCC's Form 477 data for Albermarle County (made up of 1,800 census blocks) indicates that there are 4[redacted].

40. [redacted],[38] [redacted]. This average calculated using the FCC's Form 477 data was based on 155,196 observations (one observation for each census block),[39] however each observation represents the maximum number of potential attaching entities in the subject census block. Thus, the average number of attaching entities calculated using the FCC's Form 477 data is likely a high-end estimate compared to estimates of the number of attachers that would be derived from an update of Dominion's pole survey.

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I declare under penalty of perjury under the laws of the United States that foregoing is true and correct to the best of my knowledge.

William P. Zarakas

Dated: November 18, 2015

[37] Aggregating census blocks at the county level differs slightly from aggregation at the service area level. However, estimates of the potential number of attaching entities at the Dominion level should produce the same result.

[38] [redacted]

[39] Compared to the 2,210 observations included in Dominion's statistically valid 2001-2002 pole survey.

TABLES AND FIGURES
(REDACTED FOR PUBLIC VERSION)

APPENDIX A

WILLIAM P. ZARAKAS
Principal

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William P. Zarakas is a Principal with The Brattle Group, an economics consulting firm, and an expert on economic and regulatory matters involving the communications and energy industries. He has worked on a wide range of issues concerning the telecommunications and media industries, including cost and pricing analyses in regulated industries, economic feasibility analyses associated with building-out broadband infrastructure, valuation of wireless spectrum, and, analyses rates and the distribution of royalties in the cable and satellite television industries.

Mr. Zarakas also has extensive experience in analyzing the economics and regulation of utility infrastructure and the evolving factors that are affecting utility business models. Recent applications of this focus include the impacts distributed generation resources on utility business models and cost-benefit analyses relating to utility investments in smart grids and system resiliency. Mr. Zarakas also works on matters pertaining to the regulatory frameworks, notably with respect to performance based regulation, and the valuations of utility assets and businesses. He has also examined the impacts of investment levels, operational performance, operating cost levels, and rates on utility equity prices and on customer satisfaction.

Mr. Zarakas has provided testimony and expert reports before the Federal Communications Commission, the Federal Energy Regulatory Commission, the Securities and Exchange Commission, the Copyright Royalty Judges (Library of Congress), the U.S. Congress, state regulatory agencies, arbitration panels, foreign governments and courts of law. He has led (and authored reports concerning) special investigations on behalf of corporate boards of directors and audits of management practices and operational and financial performance on behalf of regulatory commissions. He holds an M.A. in economics from New York University and a B.A., also in economics, from the State University of New York.

Communications Economics and Valuations

- Competition Modeling. Provided testimony concerning vertical foreclosure and Nash bargaining models in the Application of Comcast Corporation, General Electric Company and NBC Universal, Inc. for Comcast to Assign or Transfer Control of Licenses, Federal Communications Commission, MB Docket No. 10-56.
- Cost Modeling: Developed model that estimated the cost of deploying mobile broadband in rural areas, on behalf of GCI. Authored expert report and presented model and conclusions to the FCC In The Matter Of Connect America Fund and Universal Service Reform – Mobility Fund.
- Royalty Distribution: Analyzed costs and value of retransmitted television programming in cable and satellite video markets and determined distribution of copyright royalty fees among content providers. Authored expert report Before The Copyright Royalty Judges, Library of

Congress, Washington D.C. In The Matter of Distribution of the 2004 and 2005 Cable Royalty Funds, Docket No. 2007-3 CRB CD 2004-20. June 1, 2009

- Spectrum Valuation: Directed, authored reports, and/or provided expert testimony in cases involving valuations of wireless spectrum valuation. Cases involved determining market comparable values and performing discounted cash flow (DCF) and econometric-based analyses. Analyses were conducted on behalf of communications carriers, regulatory and governmental agencies in the U.S. and abroad, capital management companies, financial institutions and debtors.
    - Conducted analyses and authored expert report estimating value of Mobile Satellite Service (MSS) spectrum (i.e., the 2 GHz Band from 2000-2020 MHz and 2180-2200 MHz, the Big LEO from 1610-1626.5 MHz and 2483.5-2500 MHz, and the L-band from 1525-1559 MHz and 1626.5-1660.5 MHz) in several matters, including matters involving the Terrestar bankruptcy. Analyses included impact of incorporating FCC authorized ancillary terrestrial component (ATC) into MSS mobile broadband networks.
    - Analyzed spectrum values in the 2.3 and 2.5 GHz bands for the U.S. market.
    - Analyzed value of Advanced Wireless Services (AWS; 1.7 / 2.1 GHz) band for the U.S. market.
    - Analyzed value of unpaired 2.1 GHz spectrum for the U.S. market.
    - Analyzed value of 2.3 GHz (WCS) 3.5 GHz (FWA) spectrum in Canadian market.
    - Authored report concerning market comparable analysis of U.S. PCS market.
    - Provided expert testimony concerning potential value of wireless spectrum in the 700 MHz band.
    - Analyzed value of Specialized Mobile Radio (SMR) and Private Land Mobile Radio Services (PLMRS) spectrum on behalf of utility operating companies in the U.S. market.
    - Analyzed value of narrowband PCS and IVDS spectrum portfolio.
    - Directed, led analysis and authored report concerning valuations of wireless spectrum in the Middle East-North African (MENA) region for an international wireless operator.
    - Directed, led analysis and authored report concerning impact of additional wireless operators on spectrum values for the telecommunications regulator in the Kingdom of Jordan.

- Pole Attachments: Analyzed and provided testimony concerning the determination of the rates for pole attachments under the FCC's Cable Rate and Telecom Rate Formulas as applied to electric utility distribution assets. Virginia Cable Telecommunications Association v. Virginia Electric and Power, 2001.
- International Arbitration (satellite communications): Authored expert report concerning the impact of an alleged breach of contract on lost profits in a 23 country business operation concerning a satellite communications business. Performed detailed financial modeling to determine revenues, net income and net present value using risk adjusted discount rates for a satellite service provider.
- Commercial Litigation (broadband communications): Provided expert testimony concerning the estimate of commercial damages stemming from an alleged breach of contract associated with relocating infrastructure assets. Public Service Company of New Mexico vs. Smith Bagley, Inc. and Lite Wave Communications LLC In The United States District Court For The District of New Mexico. March 2007.
- Commercial Litigation (wireline communications): Developed analysis and supported expert testimony concerning damages associated with cable breaks and disruption of wholesale transport services. Analysis involved estimating lost profits and determining replacement cost of temporarily lost capacity. MCI WorldCom Network Services, Inc. v. MasTec, Inc. before the United States District Court Southern District of Florida, Case No. 01-2059-CIV-GOLD. May 2002.
- Asset Valuations: Directed and led multiple valuation analyses of telecommunications assets and businesses. Projects included valuations of infrastructure assets in multiple markets worldwide. Projects required comprehensive discounted cash flow and net present value analyses, as well as regression and statistical analyses of comparable market transactions. Projects resulted in valuations used in support of negotiations and/or in commercial litigation.

Rate, Cost, Pricing and Regulatory Analyses

- Performance Based Ratemaking Analyses. Conducted for utilities and regulators on matters concerning incentive regulatory frameworks as well as targeted performance incentives. Recent examples of authored expert reports and testimony: Massachusetts D.P.U. 12-120 and Hawaii Docket No. 2013-1041.

- Incentive Analysis for Electric Distribution Reliability. Comprehensive analysis of approaches to setting electric distribution reliability standards on behalf of the Australian Energy Market Commission (AEMC).
- Incentive Regulation. Comprehensive analysis of incentive systems to be applied to incumbent local exchange telephone carriers (ILECs) on behalf of the New York State Department of Public Service; involved modeling determining total factor productivity (TFP) based on empirical analysis and consideration of projected performance improvement initiatives.
- Electric Distribution Resiliency Analysis. Comprehensive benefit cost analysis employing value of lost load (VOLL) methodology conducted for Public Service Electric & Gas (PSE&G) in NJ BPU Docket No. EO13020155 and GO13020156.
- Cost and Rate Analyses:
  - Conducted for electric utilities concerning deployment of upgraded transmission and distribution infrastructure and smart grid applications.
  - Conducted on behalf of telecommunications and broadband companies in the United States, Europe and Asia concerning cost-of-service and incremental pricing principles for communications services products.
  - For a municipality deploying a Wi-Fi network by using street lights and utility infrastructure; analysis included determination of cost of service.
  - Expert Witness in multiple U.S. state regulatory proceedings concerning analysis of rates for unbundled network elements (UNEs), undertaken in fulfillment of requirements associated with the Telecommunications Act of 1996, using the Total Element Long Run Incremental Cost (TELRIC) methodology.
- Financial and Pricing Analyses: Conducted comprehensive financial analysis for a broadband communications provider in the U.S. market, including: developing projections of demand, price elasticities, revenue and capital and operating costs, and pricing points.
- Transfer Pricing: Performed comprehensive studies of affiliate transactions and cost allocations between holding companies and operating subsidiaries on behalf of telecommunications carriers and electric and gas utilities. Report filed before state regulatory commissions and the Federal Communications Commission.

- Performance Analysis: Analyzed wholesale access performance measurement systems on behalf of SBC (now AT&T). Project scope included analysis of the statistical validity of performance measures agreed upon by SBC and regulators as part of approval of SBC's provision of long distance services (as part of proceedings concerning Section 271 of the Telecommunications Act of 1996) or are the outcome of negotiations among various parties regarding proposed mergers. Work focused on detailed statistical testing of performance measures to determine whether measures reflected RBOC performance and supported regulatory goals of increased consumer welfare in local exchange markets.
- Regulatory Frameworks: Directed and led multiple engagements on behalf of telecommunications carriers, utilities and regulatory commissions concerning the analysis of changes in regulatory frameworks, including: theoretical and quantitative analysis of the impact of adoption of earnings-based and price-based incentive rate plans upon retail prices and service quality; and a study of the impact of alternative regulatory frameworks on ILEC deployment of advanced telecommunications services, performed on behalf of a state regulatory commission.

Utility Strategic and Management Analysis

- Investment Analysis: Authored expert report concerning the impact investments in electric and gas utility infrastructure on system reliability and resiliency, especially following major weather events. Primary area of analysis involved estimation of economic value of investments to customers using value of lost load (VOLL) metrics for electric system investments and consumer surplus and value added metrics for gas system investment.
- Strategic Option Analysis: Directed Strategic Organizational Analysis for the Long Island Power Authority. Project involved definition and analysis of organizational options (privatization, municipalization and outsourced management services arrangements) available to LIPA going forward. Options were evaluated based on rate impacts and risk factors, including risks associated with organizational transformation. Project required extensive modeling of LIPA operations and financing scenarios, as well as analysis of power and transmission markets. Project work also involved interaction with LIPA's management team, its Board of Trustees and Board sub-committees.
- Merger Analysis: Authored expert reports concerning prospective merger savings and divestiture losses for electric and gas utilities. Scope of work included analyses involved in determining the operating and capital impacts of mergers under multiple scenarios, and also

involved the anticipated economic inefficiencies resulting from forced divestiture. Reports authored included studies of merger efficiencies and reports concerning Economic Loss Studies included in U-1 filings before the U.S. Securities and Exchange Commission. Economic Loss Studies are required under PUHCA Section 11 (b) (1) Clauses A, B, and C when utility merger results in the establishment of a registered holding company with electric and gas businesses. Work in these areas included detailed analyses of current and hypothetical future electric and gas utility operations.

- Benchmarking Analysis: Conducted transmission and distribution (T&D) function benchmarking study for a major Midwestern U.S. electric utility. Study involved comprehensive analysis of capital and operating costs and reliability and the impact that changes in expenditure would likely have upon earnings and shareholder value as well as distribution system reliability.
- Valuation: Directed and advised board of directors of a major generation and transmission (G&T) cooperative and its member electric distribution cooperatives on matters concerning: asset valuations, risk management strategy, merger and acquisition options, and outlook for retail electric markets.
- Feasibility Analyses: Conducted financial analyses and economic feasibility studies of new business opportunities for electric and gas utilities (e.g., fuel cell and distributed generation technologies and alternative fuel transportation) on behalf on numerous clients.
- Transfer Pricing: Authored reports and provided expert testimony on matters of affiliate transfer pricing, corporate overhead allocation, cost allocation, and cross-subsidization, performed on behalf of electric utilities and regulatory commissions. Also, analyzed business separation and affiliate safeguards regarding flow of information, systems access, marketing controls, employee and intellectual transfers and cost allocations for U.S. utilities.
- Rate Analysis: Conducted analyses of major utility capital investment, demand and consumption and cost-of-service performed on behalf of multiple electric and gas utilities and applied in utility rate cases before state and federal regulatory commissions
- Valuation: Performed asset valuation project on generation, transmission and distribution assets for a U.S. municipal electric utility. Determined original, trended original and replacement costs, as well as development of depreciation costs. Analyses used in developing electric rates and in proceeding on municipal special franchise taxes.

- Shareholder Value Analysis: For an east coast electric utility, analyzed impact on stock prices of new and potential markets (for core and non-core utility services), pricing strategies, underlying costs, and regulatory options.
- Margin Analysis: Conducted revenue and margin, geographic impacts and value analysis of utility energy efficiency initiatives on behalf of a major west coast electric utility.

Forensic Analysis and Special Investigations

- Forensic Analysis and Special Investigation: Directed consulting team and authored report for the forensic analysis of the economics, financial reporting and accounting associated with allegation of accounting and financial improprieties by Global Crossing. Worked on behalf of the Special Committee on Accounting Matters composed of a subset of (and reporting to) the Board of Directors of Global Crossing Ltd. Analysis involved determination of basis for revenue recognition for concurrent (i.e., "swap") transactions. Analysis included in report by the Special Committee entitled "The Concurrent Exchange of Fiber Optic Capacity and Services Between Global Crossing and its Carrier Customers." January 2003.
- Commercial Litigation: Directed expert consulting team in litigation matter concerning the deployment schedule of bandwidth on a major undersea cable project. Case involved allegations of breach of contract. Case work involved modeling of undersea fiber optic bandwidth in major undersea crossings and financial analysis of project viability.
- Forensic Analysis and Securities Litigation: Directed consulting team and led technical analysis concerning accounting and financial disclosure on behalf of the defendant in a class action against corporate officers, directors, controlling shareholders and the company's outside auditors alleging violations of the Securities Act of 1993 and the Securities Exchange Act of 1934. Scope of case involved accounting and disclosure treatment of complex leases.
- Special Investigations and Audits: Directed project teams, led technical analysis and authored reports in multiple special investigations and audits of management, operations and finance and accounting on behalf of regulatory utility commissions. Special investigations and audits involved allegations of improper cross subsidization and/or transfer pricing practices by regulated utilities (telecommunications, electric and/or natural gas) and their effect on rates charged to consumers. Special investigations and audits were conducted for regulatory commissions in Alabama, Kentucky, Maryland, New York and Pennsylvania.

Financial and Business Analyses

- Commercial Litigation: Developed expert report concerning damages associated with alleged breach of contract concerning gaming licenses in Asian casino markets. Analysis involved estimating projected cash flows under current and "but-for" scenarios.
- Economic Impact Analysis: Directed analysis and authored report regarding the effects of changes in regulatory fees and taxes on mobile prices, penetration and the macro economies of 22 countries in the Middle East and Africa. Study, conducted on behalf of a major mobile operator, involved detailed analysis of the relationships between marginal cost and prices, market structure and concentration, and empirical relationships concerning mobile penetration and GDP.
- Demand Analysis: Directed analysis and modeling of multiple projects involving the estimation and projection of segmented customer demand.
  - Analyzed U.S. subscriber market for video services.
  - Analyzed subscriber demand for communications services in the United States, Europe, Asia and the Middle East.
  - Led comprehensive analysis of current and projected market shares and competition in the consumer and business markets for network devices. Scope of work included geographic and customer segmentation; modeling included estimation of revenue and margins by segment.
- Consumer Welfare Analysis: Directed multiple analyses of impact of changes in market structure upon consumers.
  - Performed empirical analysis on panel of approximately 50 countries to demonstrate the effect of changes in levels of competition on prices, investment and other areas of consumer welfare for the global mobile telecommunication industry.
  - Directed analysis and authored white paper on empirical analysis concerning the impact of changing the price of wholesale access and levels of investment in the U.S. telecommunications market. Results reported in white paper entitled: "Structural Simulation of Facility Sharing: Unbundling Policies and Investment Strategy in Local Exchange Markets."
- Business Case Analysis: Directed and led multiple projects concerning the financial feasibility of entering new lines of business.

- Led feasibility study concerning development of publishing business for a major communications company. Work required comprehensive financial modeling.
- Performed comprehensive financial analysis for an infrastructure support company. Scope of work included market and competitive analyses, projections of market shares, cash flow modeling and pricing analysis.
- Performed comprehensive business case analysis of entry into the broadband market (including voice, internet access and video services) on behalf of a major U.S. electric utility. Scope of work included technology assessment and detailed financial modeling. Work included customer and geographic segmentation, pricing scenarios and elasticity analysis.
- Led comprehensive financial analysis concerning the deployment of a broadband communications network for an Asian electric utility. Related work included assessing transfer pricing methodologies regarding the use of utility assets, resources and easements by the broadband affiliate.
- Directed and led analysis of business diversification for multiple electric utilities. Business opportunities analyzed included dark fiber construction and third party use of utility poles, towers and conduit. Scope of analysis included financial modeling and transfer pricing.

TESTIMONY

Declaration of William P. Zarakas and Matthew Aharonian (May 22, 2015) in the United States Court for the District of Columbia Circuit United States Telecom Association, Petitioner, v. Federal Communications Commission and the United States of America, Respondents, Case No. 15-1063 (and consolidated cases).

Analysis of the FCC's Vertical Foreclosure and Nash Bargaining Models Applied To The Proposed Comcast-Time Warner Cable Transaction (December 21, 2014) and Supplemental Declaration: Analysis of the FCC's Vertical Foreclosure and Nash Bargaining Models Applied To The Proposed Comcast-Time Warner Cable Transaction (March 5, 2015) in Application of Comcast Corporation, General Electric Company and NBC Universal, Inc. for Comcast to Assign or Transfer Control of Licenses, Federal Communications Commission, MB Docket No. 10-56.

Before the Public Utilities Commission of the State of Hawaii, In The Matter of Public Utilities Commission Instituting an Investigation to Reexamine the Existing Decoupling Mechanisms for Hawaiian Electric Company, Inc., Hawaii Electric Light Company, Inc., and Maui Electric Company, Limited, Docket No. 2013-1041, On Behalf of the Hawaiian Electric Companies. Report: "Targeted

Performance Incentives: Recommendations to the Hawaiian Electric Companies," Prepared For The Hawaiian Electric Companies, William P. Zarakas and Philip Q Hanser, September 15, 2014.

Before the New Mexico Public Regulatory Commission, In The Matter Of The Application of TECO Energy, Inc., New Mexico Gas Company, Inc. and Continental Energy Systems, LLC, For Approval of TECO Energy Inc.'s Acquisition of New Mexico Gas Intermediate, Inc. and For All Other Approvals and Authorizations Required To Consummate and Implement The Acquisition, Utility Case No. 13-00231-UT, On Behalf of TECO Energy, Inc., New Mexico Gas Company, Inc. and Continental Energy Systems, LLC, Joint Applicants. March 2014.

"Analysis of Benefits: PSE&G's Energy Strong Program," by Peter Fox-Penner and William P. Zarakas. In the Matter of the Petition of Public Service Electric and Gas Company for Approval of the Energy Strong Program, NJ BPU Docket No. EO13020155 and GO13020156.

"Review and Analysis of Service Quality Plan Structure In The Massachusetts Department of Public Utilities Investigation Regarding Service Quality Guidelines For Electric Distribution Companies and Local Gas Distribution Companies." Philip Q Hanser, David E. M. Sappington and William P. Zarakas, Massachusetts D.P.U. 12-120, March 2013.

"Alaska Mobile Broadband Cost Model, Before The Federal Communications Commission In The Matter Of Connect America Fund and Universal Service Reform – Mobility Fund. WC Docket No. 10-90 and WT Docket No. 10-208A." William P. Zarakas and Giulia McHenry, February 2013

Expert Report of William P. Zarakas In The United States District Court For The Northern District of Florida MCI Communications Services, Inc., Plaintiff v. Murphree Bridge Corporation, Defendant, Case No. 5:09-cv-337, February 19, 2010.

Testimony of William P. Zarakas Before The Copyright Royalty Judges, Library of Congress, Washington D.C. In The Matter of Distribution of the 2004 and 2005 Cable Royalty Funds, Docket No. 2007-3 CRB CD 2004-20. June 1, 2009.

Declaration of William P. Zarakas In The Circuit Court of Fairfax County, Virginia In The Matter of Sharon Dougherty, Plaintiff Vs. Thomas J. Dougherty, Defendant Case No. CL 2007-008757. October 2008.

Expert report provided in Public Service Company of New Mexico vs. Smith Bagley, Inc. and Lite Wave Communications LLC In The United States District Court For The District of New Mexico. March 2007.

Expert report entitled "Comparative Market Value Analysis of Upper 700 MHz Public Safety Spectrum" in FCC WT Docket no. 96-86 (In the Matter of The Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010). June 2006.

Expert report entitled "Analysis of Potential Lost Profits Associated With The Alleged Breach of Contract Between Orbcomm and Orbcomm Asia Limited" before the American Arbitration Association. May 2006.

Direct testimony before the Federal Communications Commission in the matter of *Petition of ACS of Anchorage, Inc. Pursuant to Section 10 of the Communications Act of 1934, as amended, for Forbearance from Sections 251(c)(3) and 251(d)(1) In the Anchorage LEC Study Area*, WC Docket No. 05-281, January 9, 2006.

Expert report co-authored with Dorothy Robyn Before the U.S. House of Representatives Committee on Energy and Commerce and the U.S. Senate Committee on Commerce, Science and Transportation regarding the value of wireless spectrum in the 700 MHz band. Letters, May 18, 2005.

Direct and rebuttal testimony before the Federal Communications Commission in the matter of *Virginia Cable Telecommunications Association v. Virginia Electric and Power Company, d/b/a Dominion Virginia Power and Dominion North Carolina Power*, PA No. 01-005, December 21, 2001.

Expert report Before the U.S. Securities and Exchange Commission included in Form U-1 Application/ Declaration Under The Public Utility Holding Company Act of 1935 in the combination of Energy East Corporation with RGS Energy Group, Inc. (June 20, 2001) in Exhibit J-1, entitled "Analysis Of The Economic Impact Of A Divestiture Of The Gas Operations Of Rochester Gas And Electric Corporation," May 15, 2001.

Expert report Before the U.S. Securities and Exchange Commission included in Form U-1 Application/ Declaration Under The Public Utility Holding Company Act of 1935 in the acquisition by Sierra Pacific Resources of Portland General Electric Company, 2000 in Exhibit H-1, entitled "Analysis Of The Economic Impact Of A Divestiture Of The Gas Operations Of Sierra Pacific Resources," January 31, 2000.

Before the U.S. Securities and Exchange Commission included in Form U-1 Application/ Declaration Under The Public Utility Holding Company Act of 1935 in the combination of Energy East Corporation with CMP Group, Inc. and with CTG Resources, Inc. in Exhibit J-1, entitled "Analysis Of The Economic Impact Of A Divestiture Of The Gas Operations Of Energy East," October 29, 1999.

Before the Supreme Court of the State of New York, County of Niagara, Supplemental Affidavit in *Village of Bergen, et al. vs. Power Authority of the State of New York*, February 1999.

Rebuttal Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the North Carolina Utilities Commission, Docket No. P-100, SUB 133D, Filed March 9, 1998; *In Re: Proceeding to Determine Permanent Pricing for Unbundled Network Elements.*

Direct Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the North Carolina Utilities Commission, Docket No. P-100, SUB 133D, Filed December 15, 1997; *In Re: Proceeding to Determine Permanent Pricing for Unbundled Network Elements.*

Rebuttal Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the South Carolina Public Service Commission, Docket No. 97-374-C, Filed November 25, 1997; *In Re: Proceeding to Review BellSouth Telecommunications, Inc.'s Cost Studies for Unbundled Network Elements.*

Direct Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the Florida Public Service Commission, Docket Nos. 960757-TP/960833-TP/960846-TP/960916-TP/971140-TP, Filed November 13, 1997; *In Re: Petition of AT&T, MCI, and MFS for Arbitration with BellSouth Concerning Interconnection, Rates, Terms and Conditions of a Proposed Agreement.*

Direct Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the South Carolina Public Service Commission, Docket No. 97-374-C, Filed November 3, 1997; *In Re: Proceeding to Review BellSouth Telecommunications, Inc.'s Cost Studies for Unbundled Network Elements.*

Rebuttal Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the Tennessee Regulatory Authority, Docket No. 97-01262, Filed October 17, 1997; *In Re: Contested Cost Proceeding to Establish Final Cost Based Rates for Interconnection and Unbundled Network Elements.*

Direct Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the Tennessee Regulatory Authority, Docket No. 97-01262, Filed October 10, 1997; *In Re: Contested Cost Proceeding to Establish Final Cost Based Rates for Interconnection and Unbundled Network Elements.*

Rebuttal Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the Alabama Public Service Commission, Docket No. 26029, Filed September 12, 1997; *In Re: Generic Proceeding: Consideration of TELRIC Studies.*

Rebuttal Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the Georgia Public Service Commission, Docket No. 7061-U, Filed September 8, 1997; *In Re: Review of Cost Studies, Methodologies and Cost-Based Rates for Interconnection and Unbundling of BellSouth Telecommunications Services.*

Rebuttal Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the Louisiana Public Service Commission, Docket Nos. U-22022/22093, Filed September 5, 1997; *In Re: Review of Consideration of BellSouth Telecommunications, Inc.'s TSLRIC and LRIC Cost Studies to Determine Cost of Interconnection Services and Unbundled Network Components, to Establish Reasonable, Non-Discriminatory, Cost-Based Tariff Rates.*

Direct Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the Alabama Public Service Commission, Docket No. 26029, Filed August 29, 1997; *In Re: Generic Proceeding: Consideration of TELRIC Studies.*

Direct Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the Louisiana Public Service Commission, Docket Nos. U-22022/22093, Filed July 11, 1997; *In Re: Review of Consideration of BellSouth Telecommunications, Inc.'s TSLRIC and LRIC Cost Studies to Determine Cost of*

Interconnection Services and Unbundled Network Components, to Establish Reasonable, Non-Discriminatory, Cost-Based Tariff Rates.

Direct Panel Testimony of William P. Zarakas and D. Daonne Caldwell before the Georgia Public Service Commission, Docket No. 7061-U, Filed April 30, 1997; *In Re: Review of Cost Studies, Methodologies and Cost-Based Rates for Interconnection and Unbundling of BellSouth Telecommunications Services.*

Direct and rebuttal testimony Before the Virginia State Corporation Commission on behalf of United Telephone - Southeast, Inc. and Centel Corporation, May 1994.

Direct and rebuttal testimony Before the Tennessee Public Service Commission on behalf of United Telephone - Southeast, Inc., Docket No. 93-04818, January 28, 1994.

Direct and rebuttal testimony Before the Florida Public Service Commission on behalf of Southern Bell Telephone & Telegraph Company, Docket No. 920260-TL, December 10, 1993.

Direct and rebuttal testimony Before the Tennessee Public Service Commission on behalf of South Central Bell, Docket Nos. 92-13527 and 93-00311, March 22 and March 29, 1993.

PAPERS AND PUBLICATIONS

"Electric Utility Services and Evolving Platforms in the Mid-Atlantic Region," by William Zarakas, presented at the Mid-Atlantic Conference of Regulatory Utilities Commissioners (MACRUC) 20th Annual Education Conference, Williamsburg, VA, June 23, 2015.

"Growth Prospects and Shifting Electric Utility Business Models: Retail, Wholesale and Telecom Markets," by William P. Zarakas, *The Electricity Journal*, Volume 28, Issue 5, June 2015.

"Do We Need a New Way to Regulate Electric Utilities?," by William P. Zarakas, presented at the Energy Bar Association 2015 Annual Meeting, Washington, DC, May 6, 2015.

"Investing In Electric Reliability and Resiliency," by William P. Zarakas, presented at the NARUC 2014 Summer Meeting - Joint Electricity and Critical Infrastructure Committees, Dallas, TX, July 15, 2014.

"Utility Investments in Resiliency: Balancing Benefits with Cost in an Uncertain Environment," by William P. Zarakas, Sanem Sergici, Heidi Bishop, Jake Zahniser-Word and Peter S. Fox-Penner, *The Electricity Journal*, Volume 27, Issue 5, June 2014.

"Infrastructure and Competition in the Electric Delivery System," by William P. Zarakas, *The Electricity Journal*, Volume 26, Issue 7, September 2013.

"Low Voltage Resiliency Insurance, Portable small-scale generators could keep vital services on line during a major power outages," by William Zarakas, Frank Graves, and Sanem Sergici, forthcoming *Public Utilities Fortnightly* September 2013.

"Finding the Balance Between Reliability and Cost: How Much Risk Should Consumers Bear?," by William P. Zarakas and Johannes P. Pfeifenberger, presented at the Western Conference of Public Service Commissioners, Santa Fe, NM, June 3, 2013

"The Utility of the Future: Distributed or Not?," by William P. Zarakas, presented at Advanced Energy 2013, New York, NY, April 30, 2013

"Rates, Reliability, and Region," by William P. Zarakas, Philip Q Hanser, and Kent Diep, *Public Utilities Fortnightly*, January 2013

"Approaches to Setting Electric Distribution Reliability Standards and Outcomes," by Serena Hesmondhalgh, William P. Zarakas, and Toby Brown, The Brattle Group, Inc., January 2012

"Measuring Concentration In Radio Spectrum License Holdings," presented at the Telecommunications Policy Research Conference (TPRC), George Mason University, September 26, 2009 (with Coleman Bazelon).

"Structural Simulation of Facility Sharing: Unbundling Policies and Investment Strategy in Local Exchange Markets," White Paper, July 2005 (with Glenn A. Woroch, Lisa V. Wood, Daniel L. McFadden, Nauman Ilias, and Paul C. Liu).

"Betting Against The Odds? Why broadband over power lines (BPL) can't stand alone as a high-speed Internet offering." *Public Utilities Fortnightly*, April 2005, pp. 41-45 (with Kenneth J. Martinian).

"The Impact of the Number of Mobile Operators on Consumer Benefit," White Paper, March 2005 (with Kenneth J. Martinian and Carlos Lapuerta).

"Wholesale Pricing and Local Exchange Competition", Info, Volume 6, Number 5, 2004, pp. 318-325 (with Lisa V. Wood and David E. M. Sappington).

"Regulatory Performance Measurement Plans and the Development of Competitive Local Exchange Telecommunications Markets", Working Paper, November 2003 (with David E. M. Sappington, Lisa V. Wood and Glenn A. Woroch).

APPENDIX B
(REDACTED FOR PUBLIC VERSION)